TABLE 13-1
BUILDING ENVELOPE REQUIREMENTS FOR CLIMATE ZONE 1
Minimum Insulation R-Values or Maximum Component U-Factors for Zone 1

Building Components

Space Heat Type	Components					
	Roofs Over Attic[3]	All Other Roofs[3]	Opaque Walls[1,2]	Opaque Doors	Floor Over Uncond Space	Slab-On-Grade[5]
1. Electric resistance heat** and wood-frame portions of all others	U=0.031 or R-38	U=0.034 or R-30	U=0.062 or R-19	U=0.60 for metal door; U=0.50 for wood, fiberglass, other door	U=0.029 or R-30	F=0.54 or R-10
2. All others including heat pumps and VAV	U=0.031 or (a) Metal framing: R-38 cavity insul. + R-15 continuous insulation ((~~R-30 or U=0.036~~))	U=0.034 or (a) Insulation entirely above deck: R-30 continuous insulation (b) Metal buildings: R-19 cavity insul. + R-15 continuous insulation ((~~R-21 or U=0.046~~))	U=0.062 or (a) Metal framing: R-13 cavity insul. + R-7.5 continuous insulation, and R-15 continuous insulation for peripheral edges of intermediate concrete floors (((~~(a) Metal framing: R-19 or U=0.109 (b) Wood framing & framing other than metal: R-19 or =0.062~~))	U=0.60 for metal door; U=0.50 for wood, fiberglass, other door	U=0.029 or (a) Concrete floor: R-30 continuous insulation (b) Metal joist: R-19 cavity insul. + R-15 continuous insulation ((~~R-19 or U=0.056~~))	F=0.54 or R-10

**** Compliance with nominal prescriptive R-values requires wood framing**

Maximum Glazing Areas and U-Factors and Maximum Glazing Solar Heat Gain Coefficients for Zone 1

GLAZING

Maximum Glazing Area as % of Wall	0% to 30%			>30% to 45%		
	Maximum U-Factor		Max SHGC[4,8,9]	Maximum U-Factor		Max SHGC[4,8,9]
	VG	OG		VG	OG	
1. Electric resistance heat[7]	0.40	0.48 ((~~0.60~~))	0.35 without PF, or 0.40 with PF > 0.3 for south and west	PRESCRIPTIVE PATH NOT ALLOWED		
2. All others including heat pumps and VAV[6,7]	0.40 ((~~0.55~~))	0.48 ((~~0.70~~))	0.35 without PF, or 0.40 with PF > 0.3 for south and west ((~~0.45~~))	0.40 ((~~0.45~~))	0. 48 ((~~0.60~~))	0.35 without PF, or 0.40 with PF > 0.3 for south and west

Footnotes

1. Below Grade Walls:

When complying by the prescriptive approach, Section 1322:

a) walls insulated on the interior shall use opaque wall values,

b) walls insulated on the exterior shall use a minimum of R-10 insulation,

c) walls shall be insulated for the first 10 feet below grade. (There shall be no credit for those portions of below grade walls and footings that are more than 10 feet below grade, and those portions below 10 feet shall not be included in the gross exterior wall area.)

When complying by the component performance approach, Section 1331:

a) walls insulated on the interior shall use the opaque wall values when determining U_{bgwt} ,

b) walls insulated on the exterior shall use a target U-factor of U=0.070 for U_{bgwt} ,

c) the calculations shall include the first 10 feet of walls below grade. (Those portions of below grade walls and footings that are more than 10 feet below grade shall not be included in the gross exterior wall area and shall not be included when determining A_{bgwt} and A_{bgw}.

2. Concrete and Masonry Walls: If the area weighted heat capacity of the total opaque above grade wall is a minimum of 9.0 Btu/ft^2 • °F, then:

a) The area weighted average U-factor for interior insulation may be increased to ((~~U-0.15~~)) U-0.071 maximum, or

i) minimum R-19 insulation between wood studs; or

ii) minimum R-13 cavity insulation between metal studs + R-6 continuous insulation; or

iii) minimum R-15.2 insulation held in place solely by 1 inch metal clips at 24 inches on center vertically and 16 inches on center horizontally((~~a minimum additional R-5.7 continuous insulation uninterrupted by framing; or~~)).

b) The area weighted average U-factor for integral and exterior insulation for insulation position as defined in Chapter 2 may be increased to U-0.073 maximum or a minimum additional R-12 continuous insulation uninterrupted by framing.

((~~The wall may be ASTM C90 concrete block walls, ungrouted or partially grouted at 32 in. or less on center vertically and 48 in. or less on center horizontally, with ungrouted cores filled with material having a maximum thermal conductivity of 0.44 Btu-in/h• ft^2• °F.~~))

-- Individual walls with heat capacities less than 9.0 Btu/ft^2 •°F and below grade walls shall meet opaque wall requirements listed above.

-- Glazing shall comply with the glazing requirements listed above.

3. Roof Types: A roof over attic is where the roof structure has at least 30 inches clear distance from the top of the bottom chord of a truss or ceiling joist to the underside of the sheathing at the roof ridge, and the ceiling is attached to the ceiling joist or the bottom of the truss or ceiling joist. Anything else is considered all other roofs.

4. SHGC (Solar Heat Gain Coefficient per Section 1312.2): May substitute Maximum Shading Coefficient (SC) for SHGC (See Chapter 2 for definition of Shading Coefficient).

5. Radiant Floors: Where insulation is required under the entire slab, radiant floors shall use a minimum of R-10 insulation or F=0.55 maximum. Where insulation is not required under the entire slab, radiant floors shall use R-10 perimeter insulation according to Section 1311.6 or F=0.78 maximum.

6. Prescriptive Alternate (not applicable to Target UA or annual energy analysis)**:** For the prescriptive building envelope option only, for other than electric resistance heat only, glazing may comply with the following:

Maximum Glazing Area as % of Wall:	Maximum U-Factor		Max.
	VG	OG	SHGC[4]
>45% to 50%	0.35	0.42	0.30

7. **Prescriptive Alternate** (not applicable to Target UA or annual energy analysis): For glazed wall systems, assemblies with all of the following features are deemed to satisfy the vertical glazing U-factor requirement of U-0.40 and the overhead glazing U-factor or U-0.48:

   a. Double glazing with a minimum 1/2 inch gap width, having a low-emissivity coating with e=0.10 maximum, with 90% minimum argon gas fill, and a non-aluminum spacer (as defined in footnote 1 to Table 10-6B), and

   b. Frame that is thermal break aluminum (as defined in footnote 7 to Table 10-6A), fiberglass, wood, aluminum clad wood, vinyl, aluminum clad vinyl, or reinforced vinyl.

8. **Daylighting with Plastic Skylights.** For plastic skylights, the SHGC is allowed to be SHGC-0.65 maximum provided that:.

   a. the visible transmittance (VT) is greater than the SHGC and

   b. the skylight area is no greater than 6% of the overhead daylight zone.

9. **Projection Factor (PF).** See definition of projection factor in 1323.3 Exception 3 and Exhibit 1323.3. South-oriented glazing is vertical glazing oriented within 45 degrees of due south. West-oriented glazing is vertical glazing oriented within 45 degrees of due west. If area-weighted average projection factor for south-oriented and west-oriented vertical glazing is greater than 0.3, then the area-weighted average SHGC for all vertical glazing shall not exceed 0.40.